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INTRODUCTION.

This REVIEW is based on reports for October, 1889, from 2,321 regular and voluntary observers in the United States and Canada. These reports are classified as follows: 177 reports from Signal Service stations; 121 monthly registers from United States Army post surgeons; 1,414 monthly registers from state weather service and voluntary observers; 36 reports of rainfall observations in Arizona and New Mexico, furnished by the United States Geological Survey; 25 reports from Canadian stations; 169 reports through the Central Pacific Railway Company; 379 marine reports through the co-operation of the Hydrographic Office, Navy Department; marine reports through the "New York Herald Weather Service;" monthly weather reports from the local weather services of Alabama, Arkansas, Colorado, Dakota, Illinois, Indiana, Iowa, the Iowa Weather Crop Bulletin Service, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Meteorological Report of the Missouri State Board of Agriculture, Nebraska, Nevada, New England, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, and Texas, and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used.

CHARACTERISTICS OF THE WEATHER FOR OCTOBER, 1889.

The severest storms of the month occurred along and off the Atlantic coast from the south New England coast to the Carolinas from the 14th to 16th and on the 23d and 24th, when gales of great violence, attaining hurricane force at sea from the 14th to 16th, were reported. Over the north Atlantic Ocean, in addition to the disturbances of the 14th to 16th, 23d, and 24th, referred to, severe gales were reported north and northeast of Bermuda on the 5th, and over mid-ocean on the 16th and 17th. On the 7th destructive gales prevailed over and near the British Isles, and the barometer fell to 28.70 over Scotland. From this date until the 10th stormy weather prevailed in that region, and on the 9th the barometer fell below 28.80 over the more northern parts of Great Britain. The Arctic ice reported near Newfoundland and the Grand Banks was largely in excess of the average amount for the month.

The month was cooler than the average October east of the Rocky Mountains, except in Dakota, Texas west of the ninety-eighth meridian, and at stations in New Brunswick and Nova Scotia. In the Rocky Mountain and plateau regions and on the Pacific coast the mean temperature was above the average for the month. The greatest departures below the average temperature were noted from the middle Atlantic and North Carolina coasts northward over the Lake region, where they exceeded five degrees, and the most marked departures above the average temperature occurred in the northern plateau region and on the northeastern slope of the Rocky Mountains, where they exceeded five degrees. The highest mean temperature reported was 84°.5, at Fort Brown, Tex., and the lowest means were 28°.8, at Dolly Varden Mines, Colo., and 33°.2, at Atlantic, Mich. The highest absolute temperature reported by regular stations of the Signal Service was 106°, at Yuma and Fort McDowell, Ariz. The highest temperature reported by a voluntary observer was 118°, at Indio, Cal. At stations on the southeastern slope of the Rocky Mountains, in Montana, in the plateau regions, along the north and middle Pacific coasts, and at New Orleans, La., the maximum temperature was as high or higher than previously reported for October. The lowest absolute temperature reported by a regular station of the Signal Service was 9°, at Saint Vincent, Minn. The lowest temperature reported by a voluntary observer was —9°, at Pike's Peak, Colo.; at Dolly Varden Mines, Colo., and Weatherford Centre, Vt., a minimum temperature of 0° (zero) was reported. At Portland, Maine, Fort Smith, Ark., Brownsville, Tex., Oswego, N. Y., Lava, N. Mex., and Fort McDowell, Ariz., the minimum temperature was as low or lower than previously reported for October. Frost injurious to vegetation was reported as far south as North Carolina, South Carolina, and northern Mississippi on the 8th, and in Tennessee and northern Alabama on the 31st. The occurrence of killing frost was about one week earlier than usual in North Carolina and South Carolina; about two weeks early in northern Mississippi, while in Alabama and Tennessee it was seasonable.

The most remarkable feature in connection with the precipitation of the month was the heavy rainfall on the middle and south Pacific coasts, which was the heaviest ever reported in those districts for October. The heaviest rainfall for the month fell in north-central California, where at Sims, Shasta Co., 28.57 inches were reported, and it exceeded ten inches along the Oregon coast, in north-central and northwestern California, and on the California coast between the thirty-fourth and thirty-fifth parallels. No rain was reported within an area extending from north-central Montana into the British Possessions, within areas in the western part of northern Dakota, west-central and south-central Minnesota, central Texas, and extreme southern Louisiana and Mississippi. The rainfall was generally less than the average amount for October in the central valleys, the Lake region, the south Atlantic and Gulf states, over the northeastern part of the northern slope of the Rocky Mountains, the northern part of the northern plateau region, the extreme eastern parts of the middle and southern plateau regions, and in the British Possessions from the Gulf of Saint Lawrence to Vancouver Island. It was generally above the average for the month in New England and the middle Atlantic states, the middle and southern slopes of the Rocky Mountains, the plateau regions, and on the Pacific coast. The greatest departures below the average rainfall occurred on the west Gulf coast, where they exceeded five inches, and the most marked excesses on the middle and south Pacific coasts where, between the thirty-fourth and forty-first parallels, they were more than six inches, and in the Sacramento Valley more than seven inches. At Merritt's Island, Fla., Logansport, Ind., Cresco, Iowa, Harrison, Iowa, Grand Coteau, La., Thornville, Mich., Minneapolis, Minn., Fort Shaw, Mont., Lenoir, N. C., Milan, Tenn., New Ulm, Tex.,

and Madison, Wis., the rainfall was the least ever reported for October. The snowfall was unusually heavy for the season in central Colorado, southeastern Wyoming, and in Plumas county, Cal., where it exceeded twenty inches, and amounted to twenty-four inches at Summit, Plumas, Co., Cal., and Fort D. A. Russell, Wyo.

Navigation was interrupted or suspended on the upper Mississippi and upper Tennessee rivers on account of low water, and it was reported that low water in the Erie and Welland canals, attributed to continued easterly winds, rendered the passage of boats through those canals dangerous, if not impracticable, during a greater portion of the month. Damaging drought was general throughout Alabama, Louisiana, Michigan, and Minnesota, in east-central Texas, northern South Carolina, northeastern Indiana and Illinois, northern Iowa, and northwestern Ohio and Wisconsin.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for October, 1889, as determined from observations taken daily at 8 a. m. and 8. p m. (75th meridian time), is shown on chart ii by isobars. The difference between the mean pressure for October obtained from observations taken twice daily at the hours named and that determined from hourly observations, varied at the stations named below, as follows: At Washington, D. C., Philadelphia, Pa., New York, N. Y., Boston, Mass., Saint Louis, Mo., and Chicago, Ill., the mean of the 8 a. m. and 8 p. m. observations was higher by .015, .010, .015, .013, .003, and .006, respectively, than the true mean pressure.

For October, 1889, the mean pressure was highest over the lower Missouri and upper Mississippi valleys and the upper lake region, where it was above 30.15, the highest mean reading, 30.21, being noted at La Crosse, Wis. The mean pressure was above 30.00, except on the middle and north Pacific coasts, the western portions of the middle and southern plateau regions, and in the British Possessions west of the one hundred and tenth meridian. The mean pressure was lowest along the extreme north Pacific coast, where it fell to 29.92 at Port Angeles and Fort Canby, Wash., and over the western portion of the southern plateau region, where the lowest mean readings were 29.93 and 29.95, at Yuma, Ariz., and Keeler, Cal., respectively.

Compared with the distribution of mean pressure for September, 1889, an increase in pressure is shown, except on the Pacific coast north of the fortieth parallel and thence eastward over the western part of the northern plateau region, and along the Atlantic coast north of the thirty-fifth parallel. The greatest increase in mean pressure occurred over northern Minnesota and adjoining parts of Ontario and Manitoba, where it exceeded .25, whence it became gradually less marked to the Atlantic, Pacific, and Gulf coasts. The greatest decrease in mean pressure was noted on the immediate north Pacific coast, where it amounted to .15. On the Atlantic coast the greatest decrease in mean pressure was .06, at Yarmouth, N. S. For September, 1889, the mean pressure was highest from Missouri and Arkansas eastward to the Atlantic coast, and from the north Pacific coast eastward over the valleys of the Columbia and Snake rivers, where it rose above 30.05, while for the current month the highest pressure occupies a well-defined area over the north-central part of the country, with included values above 30.15. The area of low pressure in the British Possessions north of Dakota and Montana in the preceding month has disappeared, while within the area of low pressure in the lower Colorado valley there has been an increase of .11 at Yuma, Ariz., and .08, at Keeler, Cal., respectively.

Compared with the normal pressure for October the mean pressure for the current month was above the normal, except from New England and the Saint Lawrence Valley southwestward to the east Gulf coast, along the Pacific coast, and over the northern plateau region. The greatest departures above the normal occurred in the upper lake region, Minnesota, and eastern Dakota, where they varied from .10 to .20. In New Brunswick and Florida the departures above the normal were less than .05. The most marked departures below the normal pressure were noted on the north Pacific coast, where they exceeded .10. Along the immediate Atlantic coast from New England to South Carolina the departures below the normal pressure were more than .05.

BAROMETRIC RANGES.

The monthly barometric ranges at the several Signal Service stations are shown in the table of miscellaneous meteorological data. The general rule, to which the monthly barometric ranges over the United States are found to conform, is that they increase with the latitude and decrease slightly, though somewhat irregularly, with increasing longitude. In October, 1889, the monthly ranges were greatest from northeastern Michigan eastward to north-central New York, where they equalled or exceeded 1.00, whence they decreased east-southeastward to .80 on the south New England coast; southward to less than .30 over extreme southern Florida; west-southwest to less than .30 in the lower Colorado valley; and westward to less than .60 on the northeastern slope of the Rocky Mountains, from which region they increased to more than .90 on the north Pacific coast. Along the Atlantic coast the monthly ranges varied from .27 at Key West, Fla., to 1.00 at Oswego, N. Y.; between the eighty-second and ninety-second meridians, .41 at Cedar Keys, Fla., to 1.09 at Sault de Ste. Marie, Mich.; between the Mississippi River and the Rocky Mountains, .39 at Galveston, Tex., to .81 at Bismarck, Dak.; in the Rocky Mountain and plateau regions, .29 at Yuma, Ariz., to .95 at Walla Walla, Wash.; on the Pacific coast, .30 at San Diego, Cal., to .98 at Portland and Roseburgh, Oregon, and Fort Canby, Wash.

AREAS OF HIGH PRESSURE.

Seven well-defined areas of high pressure appeared within the limits of the United States during the month of October, four of which were first observed on the Pacific coast, and four areas disappeared on the Atlantic coast. The areas of high pressure reaching to the north of the Rocky Mountains inclined slightly to the north of east until after the centre of greatest pressure had passed the Rocky Mountains, while the general movement of all areas of high pressure to the east of the Rocky Mountains was to the south of east; and the region of greatest frequency of these disturbances included the territory near the ninetieth meridian north of the fortieth parallel, the greatest number passing over the upper lake region.

The following tables exhibit some of the more prominent characteristics of the high areas:

TABLE I.

No.	First observed.			Last observed.		Duration.	Velocity per hr.	Highest pressure.		
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.			Date.	Station.	Reading.
		°	°	°	°	*Days.*	*Miles.*			*Inches.*
I.....	1	40	99	38	76	2.5	23.0	2	Parkersburgh, W. Va ..	30.24
II.....	1	40	127	33	87	11.0	{*17. 7.	5	Winnipeg, Man.....	30.58
III.....	3	53	102	46	77	1.5	39.0	4	Green Bay, Wis	30.40
IV.....	8	39	127	42	112	3.5	13.0	11	Baker City, Oregon.....	30.34
IVa	12	55	98	42	88	3.5	14.0	14	La Crosse, Wis.....	30.58
IVb.....	14	45	128	31	97	4.5	25.0	17	North Platte, Nebr	30.46
V.....	18	54	117	47	62	6.5	20.0	23	Saugeen, Ont	30.70
VI.....	24	41	117	45	73	6.5	20.0	25	Salt Lake City, Utah ...	30.36
VII.....	30	41	127	47	120	1.5	20.0	31	Baker City, Oregon	30.60
Mean.	....	45	116	41	88	4.6	20.7	....	.....	30.47

*Seventeen miles, rate of progress until the centre reached the south Atlantic states; seven miles, rate of progress thereafter until it disappeared.